REFLECTING BEHAVIORAL PROCESSES IN INTEGRATED MODELS OF ACTIVITY-TRAVEL DEMAND AND DYNAMIC NETWORK SUPPLY: A NOVEL EVENT-BASED FRAMEWORK

Abstract: The developments in the microsimulation modeling of two key components of the transportation system, namely, activity-travel demand and dynamic time-dependent network supply has happened largely independently. However, there are important interdependencies between the model systems at play which need to be reflected in an integrated modeling framework to accurately model the transportation system and subsequently conduct valid planning studies and policy analyses. On the one hand, the network level of service measures affect various dimensions of activity-travel engagement, and on the other hand, network level of service measures in the supply model are affected by people's activity-travel choices as generated by the demand model. Therefore the interaction between the activity-travel demand and dynamic network supply is bidirectional and the interdependencies operate at a fine temporal resolution, thus calling for a tight coupling of the model systems to accurately represent underlying decision making behaviors. However, there are very few conceptual designs or operational implementations that integrate activity-travel demand and dynamic network models in a behaviorally consistent fashion. In this research, a novel event-based approach that integrates the activity-travel demand and network supply dimensions in a single unifying framework is presented. The model system depicts the interdependencies across the two components and ensures consistency in the representation of individual agents, spatial scales, and temporal units. A prototype of the event-based integrated modeling framework has been developed and implemented for Maricopa County, Arizona to demonstrate the capabilities of the proposed modeling framework over traditional approaches to integrated modeling. The richness of behavioral representation in the event-based framework is illustrated by applying the model to a network disruption scenario and understanding the impacts on activity-travel engagement patterns under varying levels of traveler information provision.

Bio: Dr. Karthik Charan Konduri is a postdoctoral researcher at the School of Sustainable Engineering and the Built Environment at Arizona State University. He received his B.Tech. in Civil Engineering from the Institute of Technology at Banaras Hindu University, India, his M.S. in Civil Engineering from the University of Kentucky, and his Ph.D. in Civil Engineering from Arizona State University. His research interests include activity-based travel behavior and time use analysis, integrated models of land-use and transport, travel demand modeling and forecasting, transportation planning and policy analysis, econometric and statistical modeling methodologies, and transportation safety. His research work has been published in peer-reviewed journals and presented at various national and international conferences. He was awarded the 2012 Pyke Johnson Award for the best paper in the field of transportation systems planning and administration by the Transportation Research Board. He has led the design and development of various transportation planning software including, PopGen – an open-source synthetic population generator, and OpenAMOS – an open-source activity-based travel demand model simulator. Dr. Konduri is also an active member of the Transportation Research Board, Institute of Transportation Engineers, International Association of Travel Behaviour Research, and World Conference on Transport Research Society.